Question Bank based on Module 4, 5 and 6

Module 4

1.

    The utility data for a network are given below. Determine the total, free, independent and interfering floats and identify the critical path.

Activity	:	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration	:	2	8	10	6	3	3	7	5	2	8

2.

A project schedule has the following characteristics:

Activity	Time (weeks)	Activity	Times (weeks)
1 - 2	4	5 - 6	4
1 - 3	1	5 - 7	8
2 - 4	1	6 - 8	1
3 - 4	1	7 - 8	2
3 - 5	6	8 - 10	5
4 - 9	5	9 - 10	7

(i) *Construct the network.*
(ii) *Compute E and L for each event, and*
(iii) *Find the critical path.*

3. An insurance company has decided to modernize and refit one of its branch offices. Some of the existing office equipments will be disposed of but the remaining will be returned to the branch after the completion of the renovation work. Tenders are invited from a number of selected contractors. The contractors would be responsible for all the activities in connection with the renovation work excepting the prior removal of the old equipment and its subsequent replacement.
The major elements of the project have been identified, as follows, along with their durations and immediately preceding elements.

Activity	Description	Duration (weeks)	Immediate Predecessors
A	Design new premises	14	–
B	Obtain tenders from the contractors	4	A
C	Select the contractor	2	B
D	Arrange details with selected contractor	1	C
E	Decide which equipment is to be used	2	A
F	Arrange storage of equipment	3	E
G	Arrange disposal of other equipment	2	E
H	Order new equipment	4	E
I	Take delivery of new equipment	3	H, L
J	Renovations take place	12	K
K	Remove old equipment for storage or disposal	4	D, F, G
L	Cleaning after the contractor has finished	2	J
M	Return old equipment for storage	2	H, L

(a) Draw the network diagram showing the interrelations between the various activities of the project.
(b) Calculate the minimum time that the renovation can take from the design stage.

(c) Find the effect on the overall duration of the project if the estimates or tenders can be obtained in two weeks from the contractors by reducing their numbers.
(d) Calculate the 'independent float' that is associated with the non-critical activities in the network diagram.

Module 5

1.
A stockist has to supply 12,000 units of a product per year to his customer. The demand is fixed and known and the shortage cost is assumed is to be infinite. The inventory holding cost is ₹0.20 per unit per month and the ordering cost per order is ₹ 350. Determine
  (i)   The optimum lot size q_0
  (ii) optimum scheduling period t_0
  (iii) minimum total variable yearly cost.

2. A manufacturer uses an item at a uniform rate of 25,000 units per year. Assume that no shortage is allowed and delivery is at an infinite rate. The ordering, receiving and hauling cost is Rs.23 per order, while inspection cost is Rs.22 per order. Interest costs is Rs.0.056 and deterioration and obsolescence cost is Rs.0.004 respectively per year for each item actually held in inventory plus Rs.0.02 per year per unit based on the maximum number of units in inventory. Determine the EOQ. If lead time is 40 days, find reorder level.

3.
The demand for a commodity is 100 units per day. Every time an order is placed, a fixed cost of ₹ 400 is incurred. Holding cost is ₹ 0.08 per unit per day. If the lead time is 13 days, determine the economic lot size and the reorder point.

Module: 6

1.

Babies are born in a sparsely populated state at the rate of one birth every 12 minutes. The time between births follows an exponential distribution. Find the following:

(a) The average number of births per year.
(b) The probability that no births will occur in any one day.
(c) The probability of issuing 50 birth certificates in 3 hours given that 40 certificates were issued during the first 2 hours of the 3-hour period.

2.

A self-service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service time, find

1. Average number of customers in the system.
2. Average number of customers in the queue or average queue length.
3. Average time a customer spends in the system.
4. Average time a customer waits before being served.

3.

A branch of Punjab National Bank has only one typist. Since the typing work varies in length (number of pages to be typed), the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8-hour work day. If the typewriter is valued at ₹ 1.50 per hour, determine.

1. Equipment utilization.
2. The per cent time that an arriving letter has to wait.
3. Average system time.
4. Average cost due to waiting on the part of typewriter i.e., it remaining idle.